CHAPTER 2
GENERAL REQUIREMENTS

2-1. Location. The term pumping station as used in this manual refers to the total pumping and water handling facility including the building for pumping equipment, inflow facilities, discharge facilities, gate structures, gravity flow conduits, headwalls, retaining walls, and other appurtenant structures and facilities. The location of a pumping station is determined by hydrologic and hydraulic considerations with due consideration for existing foundation conditions, power requirements and availability, access requirements, space restrictions, aesthetic impacts, and the desires of local concerns. The location should be selected to provide the most cost effective arrangement.

2-2. Size. The size of the pumping station and its appurtenant structures is based on the hydraulic capacity required. The size and configuration of the pumping station is determined by the sump area and depth required, the equipment clearances needed and, for larger plants, the need for other facilities such as interior maintenance space and personnel areas. Pumping plant sizing is treated in detail in EM 1110-2-3102, and EM 1110-2-3105.

2-3. General Configuration and Site Work. The facilities to be incorporated into each pumping station should be arranged to perform their functions efficiently and effectively and with consideration for economy of construction and maintenance. The site treatment will be dictated by the general plant setting (urban or rural, industrial or residential, etc.). Pumping stations may be constructed either above or below grade, may be either indoor or outdoor types, and may be designed in a variety of orientations to the inflow and discharge facilities. Personnel and equipment access required for construction and maintenance of the project are important considerations in the general plant configuration. This access may be provided by existing streets with only minor new roadway construction, or may require construction of a new roadway. This can be a significant construction cost item and should be addressed early in the design process. The presence of an access road on the pumping plant site can have a pronounced impact on the amount and type of grading and site work required, and on the design of facilities passing under or located adjacent to the roadway (e.g., retaining walls, discharge piping, etc., which may be subjected to vehicle wheel loading). Landscaping will usually be required on approach channel slopes, roadway shoulders, levee slopes, etc. Factors influencing the initial work of this type include plant setting,

size of plant area, surface treatment of surrounding area, and future maintenance of the plant site.

2-4. Design Life. Most pumping station facilities designed by the Corps of Engineers, whether operated by the Corps or a second party, should be designed for a functional life of 50 years. The impact of this requirement on the structural and architectural design of the facilities is that each component must be designed to function dependably with minimum maintenance and repair, consistent with sound economic planning and good structural and architectural design practice. The design life may be 100 years if the structure is considered to be very important and its size is such that it is considered a major civil works project. These structures have usually been retained by the Corps for operation and maintenance.

2-5. Seismic Defensive Design. In areas where seismic activity must be considered but where seismic design is not warranted by the importance of the pumping plant or by economics, certain defensive design measures can be economically built into the facility. The pumping station can be placed far enough from the protection line to allow the discharge conduits to flex under ground motion without fracturing or shearing. Also additional flexible couplings may be employed and pipe bends may be installed at intervals in the discharge lines to allow movement without failure. These measures must be considered early in the plant layout process as alternatives to seismic design procedures, which could greatly increase first cost and adversely affect the feasibility of smaller projects.

2-6. Alternative Studies. When determining the general plant layout and designing the features of a pumping station project, attention should be given to long term as well as first cost. Throughout the design process, alternative materials, methods, and equipment should be analyzed on a life-cycle cost basis to assure that overall economy is achieved over the design life of the installation.

2-7. Design Coordination. The sequence of events necessary in the design of a typical pumping station facility is graphically depicted on Plate 1, Design Network Diagram. This network indicates the necessary coordination between the various design disciplines throughout the design so the process can flow smoothly from the initial site layout through the functional layout to the final structural and architectural design of the project. Coordination among design disciplines is vital to the timely completion of a functional and cost effective design.